APPLICATION UNDER UNITED STATES PATENT LAWS

Invention: **ACCESS MONITORING VIA PICONET CONNECTION TO TELEPHONE**

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<u>This is a</u>:

[ ]   Provisional Application

[X]   Regular Utility Application

[ ]   Continuing Application

[ ]   PCT National Phase Application

[ ]   Design Application

[ ]   Reissue Application

[ ]   Plant Application

SPECIFICATION

ACCESS MONITORING VIA PICONET CONNECTION TO TELEPHONE

BACKGROUND OF THE INVENTION

5   ### 1. Field of the Invention

This invention relates generally to access monitoring. More particularly, it relates to the use of a telephone device such as a cordless telephone as a monitor of whomever is home.

10   ### 2. Background of Related Art

Whenever a person makes a call to a household that they are very familiar with such as their own, they typically want to talk to a particular household member. However, using conventional telephone equipment, a caller has no knowledge of who is at the called household (if 15   anyone) unless someone answers the telephone call and informs them.

There are times when an authorized caller might want to know who is home, and/or when they arrived home or left home. For instance, a parent might want to determine if and when a child has arrived home from school.

20   In a business scenario, a supervisor might want to know if a particular worker has arrived at their office. Moreover, the supervisor might want to know if and/or when that particular worker has left the office.

In a commercial scenario, a parole officer might want to check on the whereabouts of a particular criminal without having to 25   actually visit each household of the persons under their watch.

It is often frustrating to some callers to call in to their own household or business from a remote telephone only to have a telephone answering device or other voice messaging system answer the telephone call, leaving as a mystery whether or not anyone is at the household or 30   business and is simply screening their calls, or even not knowing who is at

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the household or business. To such frustrated callers, it is often desirable for them to know which members of their particular household or business are resident at any particular time.

Using current technology, a caller must either presume the presence or absence of a particular person by calling them or their household, and based on whether or not the call is answered presume the presence or absence of the desired person or persons.

There is a need for an accurate and remotely accessible monitoring system which allows a properly authorized caller to determine if a particular person is in the called home or business, and/or when that particular person (or persons) arrived and/or left the premises.

SUMMARY OF THE INVENTION

In accordance with the principles of the present invention, an access monitoring base unit comprises a wireless piconet front end, and a database to contain at least one entry relating to a presence of a monitored person within a monitored area.

A personal wireless piconet identifying device comprises a wireless piconet front end, and a unique wearer ID code relating to an identity of a person associated with the personal wireless piconet identifying device.

In accordance with another aspect of the present invention, an access monitoring system comprises a base unit, comprising a wireless piconet front end, and a database to contain at least one entry relating to a presence of a monitored person within a monitored area. The access monitoring system also comprises at least one personal wireless piconet identifying device, comprising a wireless piconet front end, and a unique wearer ID code relating to an identity of a person associated with the personal wireless piconet identifying device.

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A method of monitoring a presence of at least one person within a monitored area in accordance with yet another aspect of the present invention comprises establishing a wireless network between a personal wireless piconet identifying device associated with a particular

5   monitored person and an access monitoring base unit. A presence or absence of the particular monitored person within the monitored area is noted based on the established wireless network.

BRIEF DESCRIPTION OF THE DRAWINGS

10   Features and advantages of the present invention will become apparent to those skilled in the art from the following description with reference to the drawings, in which:

Fig. 1 shows an exemplary implementation of a wireless access monitoring system allowing remote access to a database of

15   relevant persons currently in the household or business, in accordance with the principles of the present invention.

Fig. 2 shows a general diagram of an access monitoring/cordless telephone base unit wireless piconet network, in accordance with the principles of the present invention.

20   Fig. 3 is a block diagram of the relevant portions of an exemplary personal wireless piconet identifier device shown in Fig. 1.

Fig. 4 is a block diagram of the relevant portions of an exemplary access monitor base unit, e.g., a base unit of a cordless telephone or a telephone answering device, in accordance with the

25   principles of the present invention.

Fig. 5 shows an alternative embodiment of the present invention wherein personal wireless piconet identifier devices establish wireless piconet network communications directly with the access monitoring base unit (e.g., a cordless telephone as shown or a telephone

answering device), in accordance with the principles of the present invention.

Fig. 6 shows an exemplary process flow diagram of access monitoring using a polling technique, in accordance with the principles of

5   the present invention.

DETAILED DESCRIPTION OF ILLUSTRATIVE EMBODIMENTS

The present invention provides a wireless piconet transmitter/receiver which is held or worn by relevant members of a

10   household (e.g., on their person, in a purse, on a jacket, etc.) The wireless piconet transmitter/receiver may be, e.g., a wireless piconet equipped watch or other jewelry.

The personal wireless piconet transmitter/receiver includes a unique code serving as a personal identifier.

15   A popular wireless piconet standard is known as BLUETOOTH. Further information about the BLUETOOTH standard is available, e.g., at www.bluetooth.com. Wireless piconet requirements such as BLUETOOTH enable various devices to communicate with one another in an effort to facilitate the exchange of information.

20   Fig. 1 shows an exemplary implementation of a wireless access monitoring system allowing remote access to a database of relevant persons currently in the household or business, in accordance with the principles of the present invention.

In particular, Fig. 1 shows the use of a wireless piconet

25   entrance/exit monitor **300** to establish temporary piconet network connections with unique personal wireless piconet identifier devices **100** such as a watch when within range. A typical range for the piconet network such as a BLUETOOTH protocol piconet network is 10 to 15 meters.

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The personal wireless piconet identifier device **100** includes an identifier code which is unique to the relevant wireless piconet network. The identifier code is communicated to the wireless piconet entrance/exit monitor **300** to provide an identification of the particular person who

5 passes through the entrance/exit **302**.

The wireless piconet entrance/exit monitor **300** may include two wireless piconet devices, one directed toward communications inward (using, e.g., a directional antenna) toward the household or business and the other directed toward communications outward from the household or

10 business. Thus, depending on which of the two wireless piconet devices are last in communication with the personal wireless piconet identifier device **100** can be used to determine whether the relevant person has entered or exited the household or business.

Another technique to determine the presence of a particular

15 person or persons using a single wireless piconet device is to use polling. Using the polling technique, a master device periodically polls all members of the piconet network to determine if they are within range of the piconet network. Any device which is within range and responds to the poll will be considered to be at home. Any device not responding to a

20 broadcast or addressed poll request will be considered to be not home.

As shown in Fig. 1, a larger range piconet network is established with a device having access to a telephone network, e.g., a cordless telephone **200**. Of course, other devices such as a telephone answering device, corded telephone, cellular telephone, etc., may serve

25 as the base of the access monitoring system.

The cordless telephone **200** includes a piconet network front end which establishes a piconet connection (e.g., a larger range scatternet up to about, e.g., 100 meters) with the wireless piconet entrance/exit monitor **300**. Based on information communicated between

30 the wireless piconet entrance/exit monitor **300** and the base unit of the

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cordless telephone **200**, a database can be maintained relating to who is currently within the household or business, and when they arrived. Historical information may also be maintained in the database, such as the time frames that particular persons were within the household or

5 business.

The wireless piconet entrance/exit monitor **300** can be incorporated into another device such as a door lock, or a door. Moreover, the wireless piconet entrance/exit monitor **300** can be mounted inside or outside the monitored area.

10 Using a remote access module in the cordless telephone **200** and a special access code, an authorized caller may call in to the cordless telephone (or telephone answering device), enter the special access code, and download any or all contents of the monitoring database.

15 The contents of the monitoring database may be downloaded in digital and/or audible form. For instance, a DTMF technique may be used to encode requested data from the monitoring database if a suitable corresponding DTMF decoder is used by the caller at the calling end. Alternatively, a voice synthesizer may be used to

20 output audibly the requested information maintained in the monitoring database. A default condition can be established, e.g., allowing a telephone answering device to automatically answer incoming calls either after a first ring or after a predetermined number of rings if nobody is within the premises as determined by the access monitoring system in

25 accordance with the principles of the present invention.

The principles of the present invention may be expanded into additional features. For instance, the likelihood of a dead battery in a personal wireless piconet identifier device **100** may be determined, e.g., based on a receive signal strength indicator (RSSI) of a last received

30 signal, and/or based on a declining pattern of a series of recent received

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signals. Thus, if a personal wireless piconet identifier device **100** fails to respond to a poll, likely causes of the absence may be explored, e.g., the likelihood or probability of a battery failure in the personal wireless piconet identifier device **100**.

5   Moreover, the likelihood of the personal wireless piconet identifier device **100** being removed from the relevant person and left stationary, e.g., on a table, may be determined. For instance, triangulation and/or RSSI may be utilized to determine whether or not the personal wireless piconet identifier device **100** is moving about the

10   household. Alternatively, an appropriate sensing device (e.g., an accelerometer) may be integrated into the personal wireless piconet identifier device **100** to detect movement. Measurement information from the sensing device may then be transmitted to the wireless piconet entrance/exit monitor **300**.

15   Utilizing measured movement information, an appropriate application program in communication with the wireless piconet entrance/exit monitor **300** may determine the likelihood or probability that the wearer has removed the wireless piconet entrance/exit monitor **300**.

       The movement or motion information may be trained or

20   compared against other information (e.g., time of day) to further refine the determination of the likelihood or probability that the person has removed the personal wireless piconet identifier device **100**. For instance, it may be less likely that the person has removed the personal wireless piconet identifier device **100** during bedtime hours, when motion is less likely.

25   Fig. 2 shows a general diagram of an access monitoring/cordless telephone base unit wireless piconet network, in accordance with the principles of the present invention.

       In particular, as shown in Fig. 2, a first wireless piconet (Piconet A) is formed by the cordless telephone **200** and any other

30   devices within the home or business desiring to communicate with one

another. A second wireless piconet (Piconet B) is formed between one or more wireless piconet entrance/exit monitors **300** and one or more personal wireless piconet identifier devices **100**. The hardware and software necessary for the establishment of wireless piconets is well

5   known in the art.

Piconet A communicates with Piconet B using a longer range wireless communication protocol, e.g., a scatternet connection using BLUETOOTH standards as shown in Fig. 2. Of course, any other suitable wireless standard may be used to provide a fixed or temporary

10   communication channel between the base unit of the cordless telephone **200** and one or more wireless piconet entrance/exit monitors **300**. Alternatively, the cordless telephone **200** may be hardwired to the wireless piconet entrance/exit monitor **300**.

Fig. 3 is a block diagram of the relevant portion of an

15   exemplary personal wireless piconet identifier device **100**, **102** shown in Fig. 1.

In particular, as shown in Fig. 3, a personal wireless piconet identifier device **100**, **102** includes a unique wearer identifier code **110**, a wireless piconet front end **114**, and a suitable processor **112** to control the

20   wireless piconet front end **114** and to store the unique wearer identifier code **110**.

The processor **112** may be any suitable processor device, e.g., a microprocessor, a microcontroller, a digital signal processor (DSP), and/or an ASIC.

25   Any suitable wireless piconet front end **114** known in the art may be used in the unique wireless piconet identifier device **100**, **102**.

The unique wearer identifier code **110** may be any suitable data, e.g., a four (4) digit alphanumeric data string. Of course, fewer or greater numbers of digits are within the scope of the present invention, as

30   is the use of only numbers, or only letters. For example, if a

BLUETOOTH solution is employed, a suitable unique wearer identifier code **110** can be directly or indirectly based on the BLUETOOTH device address of the personal wireless piconet identifier device **100, 102**.

The unique wearer identifier code **110** may be fixed by a manufacturer, or may be set or otherwise input by the user. For instance, a set of dip switches may be used to set the particular unique wearer identifier code **110**. Alternatively, a wearer or user of the access monitoring system may input the unique wearer identifier code **110** through the processor **112** using a keypad or other user input device.

Depending upon the particular application, the unique wearer identifier code **110** can be set by the manufacturer (e.g., using a BLUETOOTH device address), or can be set by the user.

The personal wireless piconet identifier device **100, 102** may be implemented in association with jewelry such as a bracelet, necklace, or watch, a key chain, a purse, a wallet, etc. The main purpose of the personal wireless piconet identifier device **100, 102** is to identify to a home wireless network that a particular person is present (or absent).

Fig. 4 is a block diagram of the relevant portions of an exemplary access monitor base unit **200**, e.g., a base unit of a cordless telephone, a telephone answering device, or a personal computer, in accordance with the principles of the present invention.

In particular, as shown in Fig. 4, the access monitor base unit **200** includes a wireless piconet front end **204**, and a telephone module **252** including a remote access module **250**. Any suitable processor **254** may be used, including a processor resident in the telephone module **252**, in the remote access module **250**, and/or in the wireless piconet front end **204**. The processor **254** may be any suitable processor, e.g., a microprocessor, a microcontroller, or a digital signal processor.

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Importantly, the access monitoring base unit **200** includes a piconet participant database **202**. The piconet participant database **202** comprises any suitable formatted listing of entries, e.g., from a simple list to an Excel(TM), Access(TM), or other commercially available

5 standardized formatted database entry.

Each entry in the piconet participant database **202** may relate to a relevant individual as identified either based solely on the unique wearer ID codes **110** communicated from relevant personal wireless piconet identifier units **100**, and/or based on an actual name of

10 the person wearing the relevant personal wireless piconet identifier unit **100**. The access monitoring base unit **200** may include mapping information to map actual names to the unique wearer ID codes **110** if necessary.

Preferably, each entry in the piconet participant database

15 **202** may also be corresponded with time stamp information obtained from a real time clock **262** relating to when that particular person entered or exited the monitored area.

Fig. 5 shows an alternative embodiment of the present invention wherein personal wireless piconet identifier devices **100, 102**

20 establish wireless piconet network communications directly with the access monitoring base unit (e.g., a cordless telephone **200** as shown or a telephone answering device), in accordance with the principles of the present invention.

In particular, as shown in Fig. 5, a temporary wireless

25 network is formed by the personal wireless piconet identifier devices **100, 102** directly with the access monitoring base unit **200** as they enter and/or exit a particular household or business. The temporary wireless network as shown is preferably a piconet using the BLUETOOTH standards, but may be a scatternet to provide longer range access monitoring, or other

30 wireless network standard.

The embodiment shown in Fig. 5 is particularly useful in smaller surroundings, e.g., within a cubicle of an office, within one or two rooms in a house, etc.

A useful extension of the access monitoring system in accordance with the principles of the present invention allows the access monitoring base unit to call or e-mail a particular person (e.g., a supervisor, a parent, etc.) once the monitored person arrives at or exits the home or office.

For instance, a properly authorized user may input a telephone number to call when a particular unique wearer ID code 110 is detected as arriving at or leaving a home or office. When called, the access monitoring base unit may play a pre-recorded or synthesized message indicating who and/or when the monitored person arrives or leaves the monitored premises. The telephone number and/or particular unique wearer ID code(s) 110 may be input by the properly authorized user after entry of a suitable security access code into the access monitoring base unit 200, either locally or through use of the remote access module 250.

Short trips out of range of the wireless access monitoring system may be filtered out to provide more accurate information. For instance, it may not be desired to have a short trip outside of the home to put the garbage by the street curbside or other short trip outside the range of the wireless access monitoring system reported as the relevant person leaving the home. Thus, a type of hysteresis may be provided to delay reporting of a person not within range of the wireless access monitoring system until after that person has been outside the range of the wireless access monitoring system for a particular length of time, e.g., for 15 minutes. The user preferably can configure the particular length of time depending upon the circumstances and/or upon the application. Confirmed absences using hysteresis in accordance with this embodiment

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may be reported to the relevant monitoring person using, e.g., an email message.

Fig. 6 shows an exemplary process flow diagram of access monitoring using a polling technique, in accordance with the principles of the present invention.

In particular, as shown in step **602** of Fig. 6, participants (i.e., personal wireless piconet identification devices **100**) join a piconet when within range of either the entrance/exit monitors **300** as shown in Fig. 1, or directly with the access monitor base unit **200** as shown in Fig. 5.

The participants preferably establish temporary wireless piconet connections with the entrance/exit monitor **300** or access monitor base unit **200** to conserve battery power in the personal wireless piconet identifier units **100**. The temporary wireless piconet connections may be occasionally established (e.g., periodically such as every 1 minute, every 5 minutes, every half hour, etc.). The establishment of the temporary wireless piconet connections are preferably initiated by the personal wireless piconet identifier units **100** to avoid the need for including expected personal identifier units **100** within a polling mechanism of the access monitor base unit **200**. However, as shown in step **604** of Fig. 6, a polling mechanism may be used by the access monitor base unit **200** to wake up and temporarily establish a wireless piconet network with any or all personal wireless piconet identifier units **100** at desired intervals.

In step **606**, the piconet participant database **202** is updated to reflect any appearances or disappearances of personal wireless piconet identifier units **100** within the monitored area.

In step **608**, a properly authorized caller may remotely access the access monitor base unit **200**, enter a suitably secure access code, and request and download desired information from the piconet participant database **202**.

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The personal wireless piconet identifying devices **100, 102** need not utilize a full wireless communications channel with the wireless piconet entrance/exit monitor **300** (Fig. 1) or directly with the access monitor base unit **200** (Fig. 5). Rather, the personal wireless piconet

5   identifying devices **100, 102** need merely have their presence known to the wireless piconet network. In this way, the personal wireless piconet identifying devices **100, 102** can be greatly simplified to reduce size and expense, and to minimize power requirements.

Given the presence or absence of particular persons within

10   a wireless home network such as a piconet network, many other applications are possible.

For instance, a cable TV access box could disable particular TV channels based on who is present in a monitored room.

As another example, a pet can be given a collar containing a

15   personal wireless piconet identifying unit **100**, and the pets presence near an exit may allow the pet to unlock an access door in the exit.

Using an access monitoring system in accordance with the principles of the present invention, a personal computer workstation can be provided with information relating to whether or not an authorized user

20   is within the vicinity, enabling or disabling particular application programs, or even automatically starting the personal computer up when the authorized person is detected as being present in the home or office.

Accordingly, a small or large area such as a home or office may be remotely monitored by a properly authorized caller using wireless

25   piconet networks between personal wireless piconet identifier devices worn or carried by particular persons and a remotely accessible access monitor base unit.

While the invention has been described with reference to the exemplary embodiments thereof, those skilled in the art will be able to

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make various modifications to the described embodiments of the invention without departing from the true spirit and scope of the invention.